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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
CHEN, CHONGSHAN	
ART UNIT	**PAPER NUMBER**
2172	7

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/842,991	LUO ET AL.
	Examiner	Art Unit
	Chongshan Chen	2172

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 February 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-35* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed on 23 February 2004 have been fully considered but they are not persuasive.

2. As per applicant's arguments regarding Urhan and Kashyap do not teach hash join first and second tuples to produce result tuples as the first and second tuples are being redistributed to plural nodes have been considered but are not persuasive. Both Urhan and Kashyap teach hash join (Urhan, Fig. 1-4, Kashyap, Fig. 2, col. 2, lines 25-35). Kashyap further teaches redistributing the first and second tuples to plural nodes according to the partitioning (Kashyap, col. 6, lines 15-19). Urhan teaches it is optimal to produce results incrementally as they become available. The early delivery of initial answers can provide tremendous improvements in the responsiveness of the system. Furthermore, in many situations, users require only a small subset of the total query answer, so returning initial results quickly is the key to system usability. Urhan further teaches some parts of a query plan can continue while others are stalled waiting for input (Urhan, page 2-3), which means the join method of Urhan produces results while waiting/receiving inputs. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine Urhan with Kashyap and modify the join method of Kashyap with the join method of Urhan in order to produce results while redistributing. This allows the user to receive initial answers while waiting for the final answer. It tremendously improves the responsiveness and usability of the system. Furthermore, it is well known in the art that data can be redistributed and joined simultaneously among plural processors (Agrawal el al., 5,884,320).

3. In response to applicant's argument that there is no suggestion to combine Urhan and Kashyap, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine Urhan with Kashyap and modify the join method of Kashyap with the join method of Urhan in order to produce results while redistributing. This allows the user to receive initial answers while waiting for the final answer. It tremendously improves the responsiveness and usability of the system.

4. In response to applicant's argument that there is no suggestion to combine Urhan, Kashyap and DeWitt, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Both Urhan and Kashyap teach hash join (Urhan, Fig. 1-4, Kashyap, Fig. 2, col. 2, lines 25-35). Kashyap further teaches redistributing the first and second tuples to plural nodes according to the partitioning (Kashyap, col. 6, lines 15-19). DeWitt teaches distributing data based on split vector (page 4-5). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine DeWitt

with Urhan and Kashyap and use the split vector in the redistribution step of Kashyap in order to find an optimal solution for redistributing data to plural nodes.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1-4, 13-24 and 33-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over T. Urhan et al. ("Urhan", "XJoin: Getting Fast Answers from slow and Bursty Networks", Technical Report, CS-TR-3994, UMIACS-TR-99-13, February 1999) in view of Kashyap et al. ("Kashyap", 5,873,074).

As per claim 1, Urhan discloses a method comprising:

storing first tuples in a first table in a database system (Urhan, page 4, Fig. 2, Tuple A);

storing second tuples in a second table in the database system (Urhan, page 4, Fig. 2, Tuple B);

partitioning the first and second tuples into plural portions (Urhan, page 4, Fig. 2, Memory-resident partitions of source A, B);

hash joining the first and second tuples to produce result tuples as the first and second tuples are being redistributed to the plural nodes (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4, page 5, "XJoin proceeds in three stages, each of which is performed by a separate thread. The first

stage joins tuples in the memory resident portions of the partitions, acting similarly to the standard symmetric hash join...").

Urhan does not explicitly disclose redistributing the first and second tuples to plural nodes according to the partitioning. Kashyap teaches redistributing the first and second tuples to plural nodes according to the partitioning (Kashyap, Fig. 2, col. 6, lines 15-19). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to distribute the tuples to plural nodes according to the partitioning in the method of Urhan. This allows the hash-join operation to be performed in parallel by executing multiple instances of the various operations simultaneously on plural nodes, and achieves faster execution.

As per claim 2, Urhan and Kashyap teach all the claimed subject matters as discussed in claim 1, and further teach retrieving the result tuples once the hash join is performed (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

As per claim 3, Urhan and Kashyap teach all the claimed subject matters as discussed in claim 1, and further teach retrieving the result tuples at random (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4, page 2-3).

As per claim 4, Urhan and Kashyap teach all the claimed subject matters as discussed in claim 1, and further teach producing result tuples at one of the plural nodes; and simultaneously producing result tuples at a second of the plural nodes (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

As per claim 13, Urhan teaches a database system comprising:

plurality of nodes (Urhan, Fig. 2);

storing first tuples in a first table (Urhan, page 4, Fig. 2, Tuple A);

storing second tuples in a second table (Urhan, page 4, Fig. 2, Tuple B);

partitioning the first and second tuples into plural portions (Urhan, page 4, Fig. 2, Memory-resident partitions of source A, B);

hash joining the first and second tuples to produce result tuples as the first and second tuples are being redistributed to the plural nodes (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4, page 5, "XJoin proceeds in three stages, each of which is performed by a separate thread. The first stage joins tuples in the memory resident portions of the partitions, acting similarly to the standard symmetric hash join...").

Urhan does not explicitly disclose redistributing the first and second tuples to the plurality of nodes according to the partitioning. Kashyap teaches redistributing the first and second tuples to the plurality of nodes according to the partitioning (Kashyap, Fig. 2, col. 6, lines 15-19). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to distribute the tuples to plural nodes according to the partitioning in the method of Urhan. This allows the hash-join operation to be performed in parallel by executing multiple instances of the various operations simultaneously on plural nodes, and achieves faster execution.

Claims 14-15 are rejected on grounds corresponding to the reasons given above for claims 2-3.

As per claim 16, Urhan and Kashyap teach all the claimed subject matters as discussed in claim 13, and further teach partitioning first tuples into first hash tables; and partitioning second tuples into second hash tables, wherein the hash tables are in the memory (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

As per claim 17, Urhan and Kashyap teach all the claimed subject matters as discussed in claim 16, and further teach allocate a portion of the memory to the first hash table; allocate a second portion of the memory to the second hash table; and hash join first tuples in the first hash table with second tuples in the second hash table (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

As per claim 18, Urhan and Kashyap teach all the claimed subject matters as discussed in claim 17, and further teach determine that the portion of the memory allocated to the first hash table is full; and store first tuples in a stable storage (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

As per claim 19, Urhan and Kashyap teach all the claimed subject matters as discussed in claim 18, and further teach continue to store second tuples in the second hash table; and hash join second tuples in the second hash table with first tuples in the first hash table (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

As per claim 20, Urhan and Kashyap teach all the claimed subject matters as discussed in claim 19, and further teach determine that the second portion of the memory allocated to the second hash table is full; allocate a second stable storage to the second hash table; store second tuples in the second stable storage; and hash join second tuples in the second stable storage with first tuples in the first hash table (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

As per claim 21, Urhan and Kashyap teach all the claimed subject matters as discussed in claim 20, and further teach generate a third hash table once all first tuples and second tuples are redistributed to each node; retrieve one of the first tuples from the stable storage; hash join the one of the first tuples with tuples in the second hash table; and store the one of the first tuples in the third hash table (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

As per claim 22, Urhan and Kashyap teach all the claimed subject matters as discussed in claim 21, and further teach retrieve one of the second tuples from the second stable storage; and hash join the one of the second tuples with tuples in the third hash table (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

Claims 23-24 are rejected on grounds corresponding to the reasons given above for claims 1-2.

As per claim 33, Urhan and Kashyap teach all the claimed subject matters as discussed in claim 1, and further teach storing the first tuples in the first table comprises distributing the first tuples across the plural nodes of the database, wherein storing the second tuples in the second table comprises distributing the tuples across the plural nodes (Kashyap, col. 2, lines 40-45).

As per claim 34, Urhan and Kashyap teach all the claimed subject matters as discussed in claim 33, and further teach redistributing the first and second tuples to the plural nodes of the database system (Kashyap, col. 6, lines 15-19).

Claim 35 is rejected on grounds corresponding to the reasons given above for claim 33.

7. Claims 5-12 and 25-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over T. Urhan et al. ("Urhan", "XJoin: Getting Fast Answers from slow and Bursty Networks", Technical Report, CS-TR-3994, UMIACS-TR-99-13, February 1999) in view of Kashyap et al. ("Kashyap", 5,873,074 and further in view of D. DeWitt et al. ("DeWitt", "Parallel Sorting on a Shared-Nothing Architecture using Probabilistic Splitting", Proc. Of the Intl. Conf. On Parallel and Distributed Information Systems (PDIS) 1991: 280-291).

As per claim 5, Urhan and Kashyap teach all the claimed subject matters as discussed in claim 4, except for explicitly disclosing redistributing the first and second tuples to plural nodes

comprises redistributing based on split vectors containing predefined ranges. DeWitt discloses redistributing the first and second tuples to plural nodes comprises redistributing based on split vectors containing predefined ranges (DeWitt, page 5). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to redistribute based on split vectors containing predefined ranges in the method of Urhan in order to exact splitting.

As per claim 6, Urhan, Kashyap and DeWitt teach all the claimed subject matters as discussed in claim 5, and further disclose partitioning first and second tuples into hash tables in each node (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

As per claim 7, Urhan, Kashyap and DeWitt teach all the claimed subject matters as discussed in claim 6, and further disclose allocating a portion of a memory to a first hash table; allocating a second portion of the memory to a second hash table; and hash joining first tuples in the first hash table with second tuples in the second hash table (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

As per claim 8, Urhan, Kashyap and DeWitt teach all the claimed subject matters as discussed in claim 7, and further disclose determining that the portion of the memory allocated to the first hash table is full; allocating a stable storage to the first hash table; and storing first tuples in the stable storage (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

As per claim 9, Urhan, Kashyap and DeWitt teach all the claimed subject matters as discussed in claim 8, and further disclose continuing to store second tuples in the second hash table; and hash joining second tuples in the second hash table with first tuples in the first hash table (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

As per claim 10, Urhan, Kashyap and DeWitt teach all the claimed subject matters as discussed in claim 9, and further disclose determining that the second portion of the memory allocated to the second hash table is full; allocating a second stable storage to the second hash table; storing second tuples in the second stable storage; and hash joining second tuples in the second stable storage with first tuples in the first hash table (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

As per claim 11, Urhan, Kashyap and DeWitt teach all the claimed subject matters as discussed in claim 10, and further disclose generating a third hash table once all first tuples and second tuples are redistributed to each node; retrieving one of the first tuples from the stable storage; hash joining the one of the first tuples with tuples in the second hash table; and storing the one of the first tuples in the third hash table (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

As per claim 12, Urhan, Kashyap and DeWitt teach all the claimed subject matters as discussed in claim 11, and further disclose retrieving one of the second tuples from the second stable storage; and hash joining the one of the second tuples with tuples in the third hash table (Urhan, page 4, Fig. 1-2, page 6, Fig. 3-4).

Claims 25-32 are rejected on grounds corresponding to the reasons given above for claims 5-12.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Agrawal et al. (5,884,320) teaches partitioning data among the processors and simultaneously redistribute and join data in processors.

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chongshan Chen whose telephone number is 703-305-8319. The examiner can normally be reached on Monday - Friday (8:00 am - 4:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John E Breene can be reached on (703)305-9790. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

April 29, 2004

SHAHID ALAM
PRIMARY EXAMINER